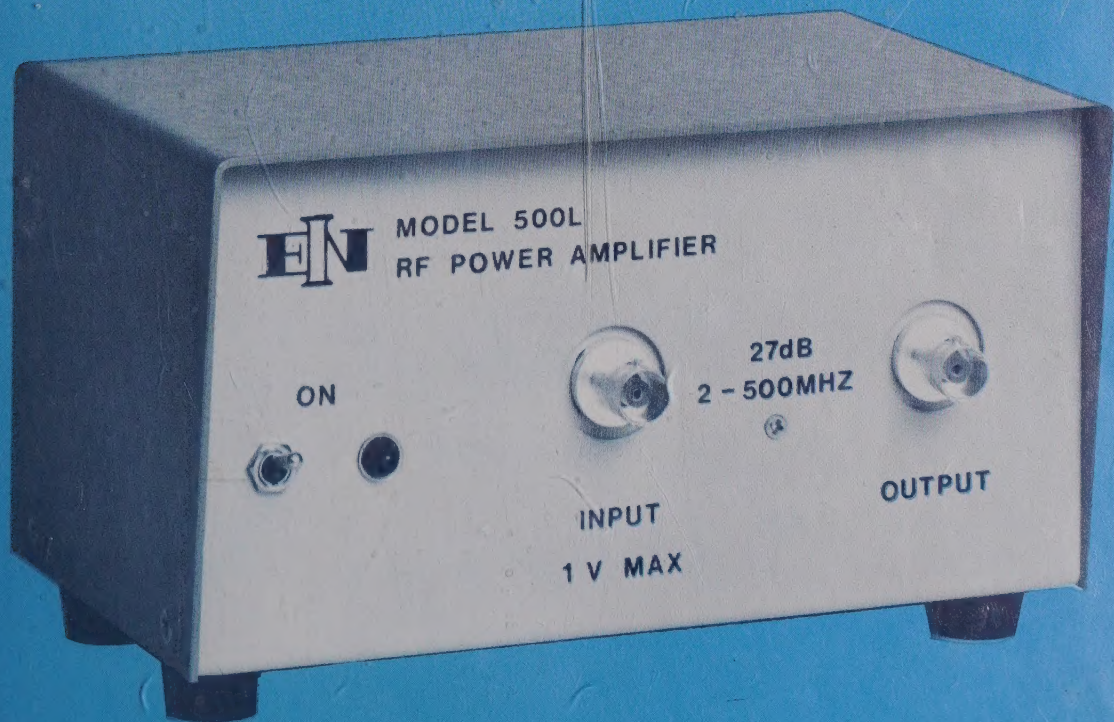
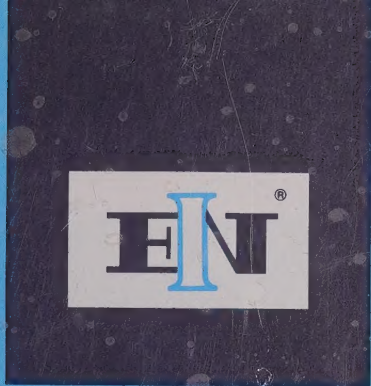


SERIES

500

RF POWER AMPLIFIERS





- ALL SOLID STATE
- FLAT 27dB GAIN,
2MHz TO 500MHz
- 1.7MHz TO 560MHz USABLE
COVERAGE
- 300 MILLIWATTS LINEAR
OUTPUT
- WORKS INTO ANY LOAD
- LOW COST
- FAILSAFE
- MICROELECTRONIC
CONSTRUCTION
- INTEGRAL POWER SUPPLY



MODEL 500L RF POWER AMPLIFIER

The Model 500L RF power amplifier is a general purpose laboratory instrument capable of moderate power outputs over a very wide range of frequencies. Consisting of hybrid integrated circuits mounted on a microstrip module, the 500L is designed to provide the user with maximum versatility at modest cost.

The amplifier will "boost" the output of any signal source by 27dB and provide more than 300 milliwatts of power from 2 to 500MHz. A linear Class A feedback

design, its output is a faithful reproduction of the input waveform for AM, FM, SSB, CATV, and pulse modulations. Although flat gain is specified over the 2 to 500MHz frequency range, full power output is typically available from 1.7MHz to 560MHz.

The 500L is unconditionally stable and can be connected to any load impedance without failure or oscillation. An integral power supply permits operation over a wide range of line variations.

APPLICATIONS

- Signal generator amplification
- TV distribution
- ECM Systems
- General laboratory use
- Wideband video
- Ultrasonics
- Electro-Optical
- S-Parameter measurements
- RFI/EMI testing

The Model 500L will extend the power output capability of signal generators, sweep generators, frequency synthesizers and other signal sources. The availability of increased power, without the complexity of tuning, increases the utility of these units.

As a drive source in Antenna, Laser, NMR, and Ultrasonic applications, the unit will provide essentially constant forward power, regardless of the transducer load impedance.

The low noise figure and high output of the Model 500L makes it ideal for the amplification and distribution of television and other signals over long cables or through multi-coupler networks.

Used as a video amplifier, the Model 500L will reproduce pulse waveforms with risetimes as short as 1 nanosecond.

SPECIFICATIONS

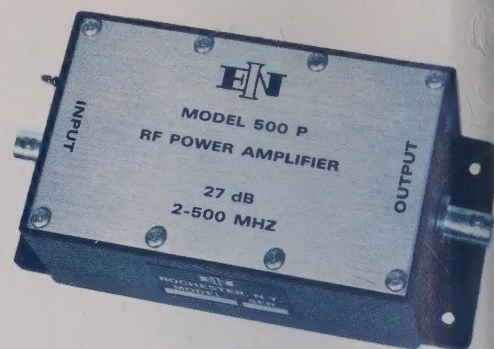
Frequency Coverage:	2 to 500MHz	Typical 3rd Order Intermodulation Intercept Point:	+38dBm
Gain:	27dB nominal	Noise Figure:	8dB typical
Gain Variation	±1dB maximum	Power Requirements:	115, 230 VAC ±12% 50-400Hz at 12 watts
Maximum Linear Power Output:	More than 300 Milliwatts	Size and Weight:	3 $\frac{3}{8}$ x 6 $\frac{1}{2}$ x 4 $\frac{9}{16}$ inches; 2 $\frac{1}{2}$ lbs.
Harmonic Distortion:	All harmonics greater than 30dB below the fundamental at 200 milliwatts output. Lower distortion at reduced power.	Operating Temperature:	0° to 45° C
Input/Output Impedance:	50 ohms, VSWR 2:1	Output Connectors:	BNC standard, SMA optional

MODEL

500P

RF POWER
AMPLIFIER

- **RUGGED**
- **ALL SOLID STATE**
- **MICROELECTRONIC CONSTRUCTION**
- **LOW COST**



Capable of reliable operation over a wide range of environmental conditions, the Model 500P is identical in electrical performance to the Model 500L. The unit's encapsulated hybrid integrated circuit amplifier is mounted on a fiberglass micro-strip board and sealed in a rugged aluminum die cast housing. External power is fed into an RFI filter to minimize signal

leakage in high sensitivity environments.

The Model 500P is designed and built to withstand the environments of most surface and airborne military specifications. It may be used as a sub-assembly in signal generators to raise their power output, in signal distribution networks and as an antenna preamplifier for large arrays.

SPECIFICATIONS

Power Requirements: 24.25 $\pm$.25VDC at
300 milliamperes

Cooling: Convection or conduction

Allowable Case Temperature: -40° to +70° C

Size and weight: 1.71 x 5.24 x 2.63 inches;
12 ounces

Thermal Resistance: 2.5° C/watt, case to air

RF Connectors: BNC standard, SMA optional

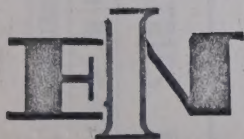
For further detailed information, or specific customer design requirements, please contact ENI or our local sales representative.



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ELECTRONIC NAVIGATION INDUSTRIES, INC.
OPERATING AND SERVICE INSTRUCTIONS

MODEL 500L
BROADBAND RF POWER AMPLIFIER



ELECTRONIC NAVIGATION INDUSTRIES Incorporated
3000 Winton Road South-Rochester, New York 14609
(716) 473-6900

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1.0 INTRODUCTION

The Model 500L RF power amplifier is a general purpose laboratory instrument capable of moderate power outputs over a very wide range of frequencies. Consisting of hybrid integrated circuits mounted on a microstrip module, the 500L is designed to provide the user with maximum versatility at modest cost.

The amplifier will "boost" the output of any signal source by 27 dB and provide more than 300 milliwatts of power from 2 to 500 MHz. A linear Class A feedback design, its output is a faithful reproduction of the input waveform for AM, FM, SSB, CATV, and pulse modulations. Although flat gain is specified over the 2 to 500 MHz frequency range, full power output is typically available from 1.7 MHz to 560 MHz.

The 500L is unconditionally stable and can be connected to any load impedance without failure or oscillation. An integral power supply permits operation over a wide range of line variations.

2.0 SPECIFICATIONS

Frequency Coverage:	2 to 500 MHz
Gain:	27 dB nominal
Gain Variation:	<u>±</u> 1 dB
Maximum Linear Power Output:	More than 300 Milliwatts
Harmonic Distortion:	All harmonics greater than 30 dB below the fundamental at 200 milliwatts output. Lower distortion at reduced power.
Input/Output Impedance:	50 ohms, VSWR 2:1
Typical 3rd Order Intermodulation Intercept Point:	+38 dBm
Noise Figure:	8 dB typical
Protection:	Unit will withstand a +14 dB overdrive (input signal of 1 volt RMS) for all output load conditions.
Power Requirements:	115, 230 VAC +12% 50-400 Hz at 12 watts
Size and Weight:	3 7/8 x 6 1/2 x 4 9/16 inches; 2 1/2 inches
Operating Temperature:	0° to 45°C
Output Connectors:	BNC standard, SMA optional

3.0 OPERATING INSTRUCTIONS

The Model 500L is easy to connect and use. The input and output are connected via the front panel connectors to the signal source and load respectively.

Precautions should be taken to insure that the input signal voltage does not exceed the 1 volt maximum input. This level is five times greater than the 0.2 volt RMS input needed to reach maximum output. Peak input voltage in excess of 2 volts may immediately damage or result in reduced operating life of the instrument.

4.0 TEST PROCEDURE

To determine proper operation of the Model 500L, the following test procedure should be used:

- (1) Connect a sweep generator (e.g. Wavetek Model 2001) capable of sweeping the frequency range of 2 to 500 MHz to the input connector.
- (2) Adjust the output level of the sweep generator so that a 50 ohm video detector connected at the output of the 500L will not be damaged by excessive power output.
- (3) Observe the gain versus frequency ripple on an oscilloscope calibrated in decibels.
- (4) The gain variation must be + 1 dB or less over the frequency range.
- (5) Connect a calorimetric power meter (e.g. HP 434A) through a short length of 50 ohm cable to the output connector.
- (6) Adjust the input CW signal at any frequency between 2 and 500 MHz for 200 milliwatts output.

- (7) Observe the harmonic distortion of the output on a spectrum analyzer. The harmonic components contributed by the amplifier must be more than 30 dB down from the fundamental.

5.0 CIRCUIT DESCRIPTION

A circuit diagram of the Model 500L is shown in Figure 1.

Signal from the front panel connector is fed through a length of micro-strip transmission line to a pi-type attenuator. The attenuator is adjusted during alignment to insure that the actual gain of the unit is 27 dB. Output from the attenuator is fed to the microelectronic thin film amplifier module (ENI 802) through impedance matching transformer T_2 .

The heart of the Model 500L is the four transistor circuit mounted on a 0.5 x 1.0 inch alumina substrate. The transistor chips are bonded to "heat spreaders" to reduce their operating temperature and permit higher power output. All components are mounted on the substrate of the module package except for the RF power transformer T_3 . Transformer T_3 and capacitor C_7 match the power output stage of the module to the 50 ohm output load.

The 500L is powered by a regulated supply capable of supplying 24 volts at a current of 300 MA. The power supply regulator consisting of series pass transistor Q_2 and integrated circuit regulator Q_3 is mounted on the "mother board" directly in front of the amplifier module. A light emitting diode D_1 is connected at the regulator output and when visible on the front panel, indicates proper operation of the power supply.

6.0 REGULAR ADJUSTMENT AND MAINTENANCE

There are no periodic electrical adjustments required to maintain the amplifier gain and power output characteristics.

7.0 115 - 230 VOLT OPERATION

The power supply switch is located at the right rear of the unit. For 115 volt operation, the switch must be placed in the lower position and the marking "115" must be clearly visible. For 230 volt operation, the switch must be placed in the upper portion and the marking "230" must be visible.

Under no circumstances should this switch be thrown while power is connected. Before the Model 500L is connected to a 230 volt line, check the position of the switch. Extensive damage will result to the unit if it is placed in the wrong position.

8.0 CASE REMOVAL

The cover of the unit may be disassembled by removing the four retaining screws located on two sides. Do not remove the amplifier and module retaining screws, as the units must be precisely aligned for proper mechanical fit.

9.0 TROUBLESHOOTING

If the Model 500L should fail to operate and the panel light does not glow, check the condition of the fuse at the rear of the unit ($\frac{1}{2}$ amp SB, 3AG).

When service is required the following steps should be taken:

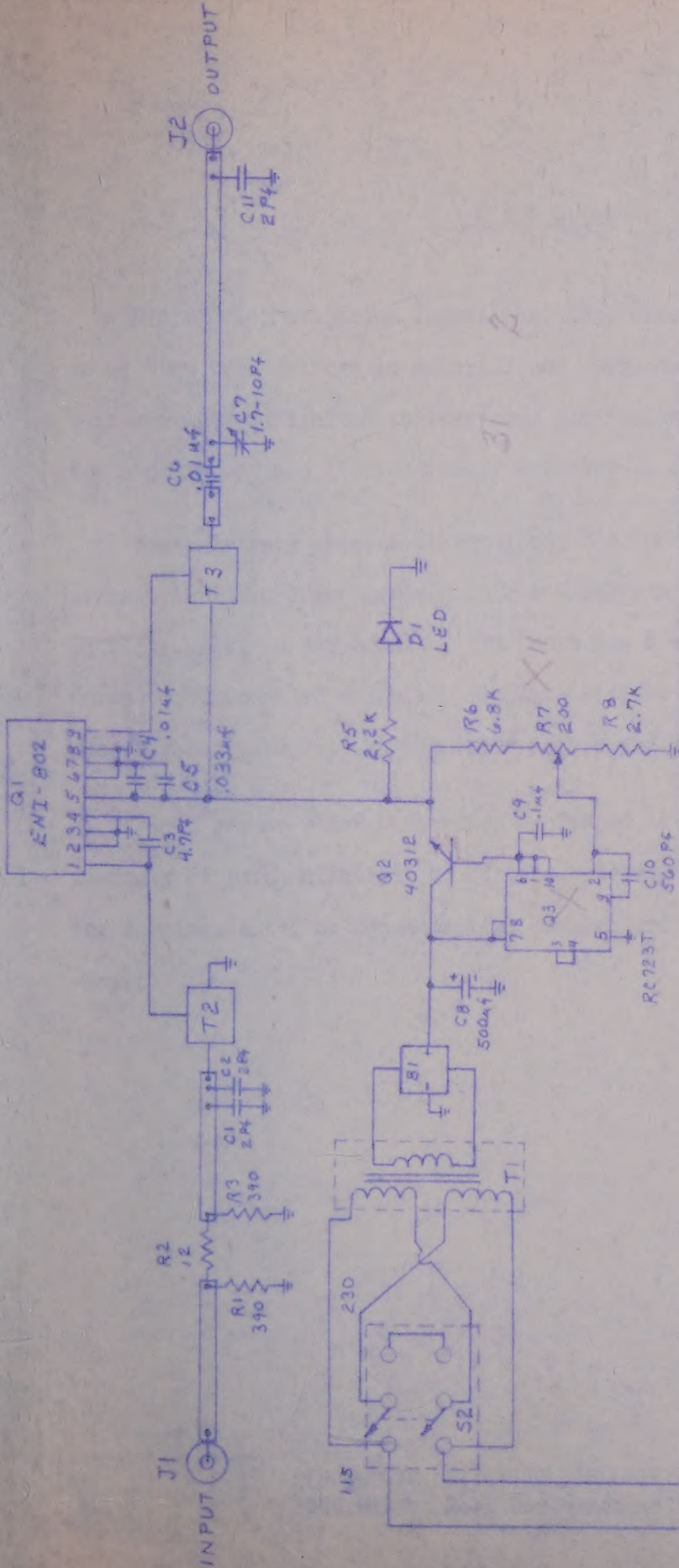
- (1) Notify the factory, giving full details of the difficulty. Include the instruments serial number.
- (2) Upon receipt of shipping instructions, forward the instrument, transportation prepaid, to the factory or the authorized repair station indicated on the instructions.

If requested, an estimate of the charge will be made before the work begins, provided the instrument is not covered by warranty.

PARTS LIST

Model 500L RF Power Amplifier

	<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>FEDERAL SUPPLY</u> <u>CODE</u>
A1		390 ohms 1/4 watt 5%	
A2		12 ohms 1/4 watt 5%	
R3		390 ohms 1/4 watt 5%	
R5		2200 ohms 1/2 watt 5%	
R6		6800 ohms 1/2 watt 5% HC5	
R7	3389-1-201	200 ohms variable	32997
R8		2700 ohms 1/2 watt 5% HC5	
C1	DM5-020D	2 Pfd $\pm$.5%	72136
C2	DM5-020D	2 Pfd $\pm$.5%	72136
C3	DTZ-4R7	4.7 MF NPO	71590
C4	SC1BU123VS	.012 Mfd Monoceram Chip	96733
C5	8121-050-651-333M	.033 Mfd	72982
C6	SC21BU123VS	.012 Mfd Monoceram Chip	96733
C7	9301	1.7-10 Pfd variable	91293
C8	TC50050A	500 Mfd 50 volts	90201
C9	8131-050-651-104M	.1 Mfd	72982
C10	CM06FD561 J03	560 Pfd 500 WVDC	
C11	DM5-020D	2 Pfd $\pm$.5%	72136
L1	5082-4403	Solid State Lamp	28480
L2	ENI-802	2-500 MHz Amplifier	10226
L3	40312	Transistor	02735
L4	RC 723T	Voltage Regulator	49956
L5	AM6400A	Transformer	12715
L6		Transformer	10226
L7		Transformer	10226
L8	UG 657/U	Connector	
L9	UG 657/U	Connector	
F1	3 AG 1/2	Fuse 1/2 amp S.B.	
F2	LF142001	Fuse Holder	
S1	ST-1	SPDT	American Switch
S2	SW-12-HK-115/2.0	2 Pdt	22753
	17737-S	Line Cord	70903



LTR	REVISIONS	DATE

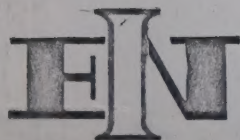
ELECTRONIC NAVIGATION INDUSTRIES, INC.				
TOLERANCE EXCEPT AS NOTED	MODEL NO.	SCALE	DRAWN BY	APPROVED BY
DECIMAL —	500L	—		
FRACTIONAL —	DESCRIPTION MODEL 500L RF POWER AMPLIFIER			
ANGULAR —	DATE 15 Sept 92	DRAWING NUMBER		

W A R R A N T Y

Electronic Navigation Industries, Inc. warrants each instrument to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing and replacing any defective parts for a period of one (1) year after delivery to the original purchaser.

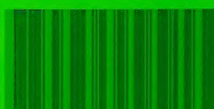
When warranty service is required, the instrument must be returned transportation charges prepaid to the factory or our authorized service facility. If, in our opinion, the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

There are no other warranties expressed or implied, including any warranty of merchantability or fitness. Seller shall not be responsible for any incidental or consequential damages arising from any breach of warranty.



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